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FIRST REVISION - 1969

HABITAT MANAGEMENT PLAN

ASH MEADOWS PUPFISH HABITAT

N5-WHA-A1

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FIRST REVISION - 1969

HABITAT MANAGEMENT PLAN

ASH MEADOWS PUPFISH HABITAT

N5-WHA-AI

6626
J-4

Prepared by Lewis H. Myers
Bureau of Land Management
Las Vegas District

With assistance by and in cooperation with
Dale Lockard

Nevada Fish and Game Department, Las Vegas
and

Dr. James E. Deacon
University of Nevada, Las Vegas

Concurred by: Nevada Fish & Game Dept. 1/26/70 (Date) John Lockard Regional Supervisor

University of Nevada 1/26/70 (Date) James E. Deacon Representative

Approved by: Bureau of Land Management 2-17-70 (Date) District Manager

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I. Introduction

This plan is directed towards preservation of the habitat of two unique, endemic fishes; the Big Spring Amargosa Pupfish (Cyprinodon nevadensis mionectes) and the Lovel Spring Amargosa Pupfish (Cyprinodon nevadensis pectoralis). This species was included in a publication "Rare and Endangered Fish and Wildlife Species of the United States", compiled by the Bureau of Sport Fisheries and Wildlife, U. S. Dept. of the Interior.

Official status (1969) is "undetermined". This will soon be revised as "rare" through recommendation of the University of Nevada.

In recent years Nevada Pupfish have been eliminated from two private springs, Fairbanks and Crystal, and one spring on public domain (1969), Jackrabbit.

Four springs comprising pupfish habitat occur on public domain. They are:

(1) School Spring, NE¼SE¼SE¼, Sec. 35, T.17S., R.50E., M.D.M.

(2) Jackrabbit Spring, SE¼NW¼, Sec. 18, T.18S., R.51E.

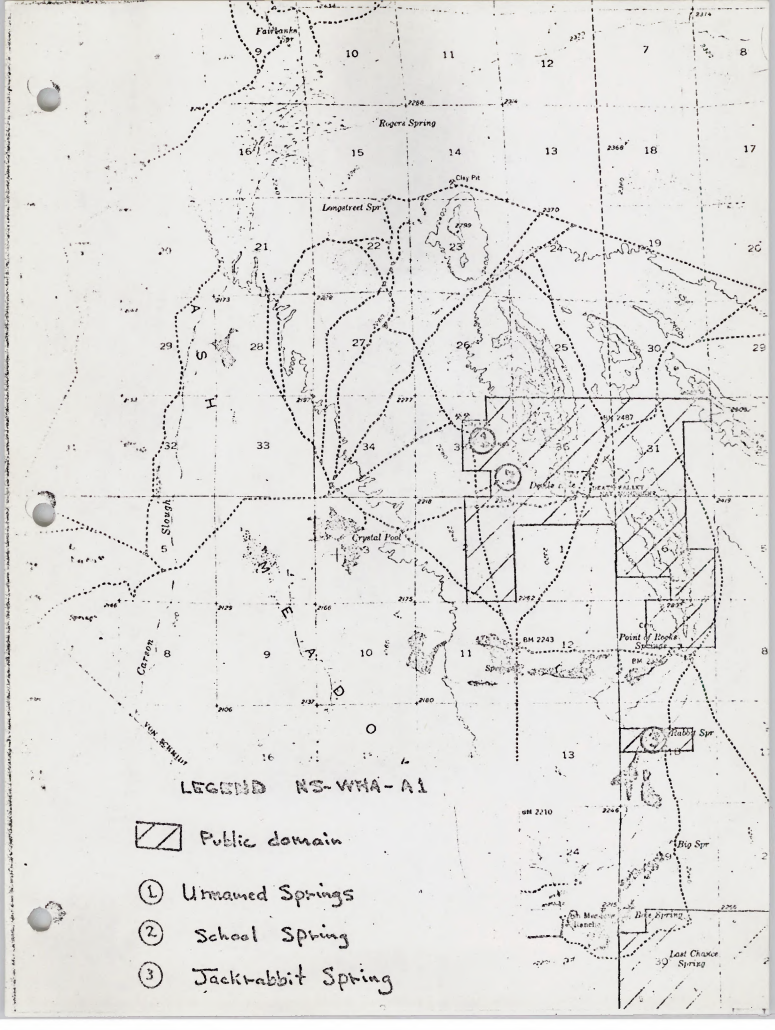
(3) Unnamed Springs, both SW¼NE¼, Sec. 35, T.17S., R.50E.

Recent (1968) large scale agricultural developments have seriously threatened survival of the species. A pupfish population numbering about 2,000 was exterminated in Jackrabbit Spring following installation and operation of a large pump by the water user.

Nearby Devil's Hole, a large water filled limestone cavern, has been included within the Death Valley National Monument System. It contains the worlds only population of Cyprinodon diabolis.

Ash Meadows is in the Southern Amargosa Desert, between Lathrop Wells and Pahrump, Nevada. The Amargosa River flows southward through it. Spring water probably has its ultimate source in precipitation on the northern part of the Spring Mountains 20 miles to the east (Denny and Drewes, 1965).

The climate is hot and dry. Average annual precipitation is probably about 3 inches. On the valley floor average maximum monthly temperature for July is greater than 100° F. Vegetation is Lower Sonoran desert scrub.



LEGEND NS-WHA-A1

Public domain

① Unnamed Springs

② School Spring

③ Jackrabbit Spring

II. Management Objectives

A. Obtain restoration of Jackrabbit Spring pool and pupfish population (about 2,000 fish) through negotiations with Spring Meadows Inc.

B. Protect pupfish habitat at Jackrabbit, School, and Unnamed Springs from livestock trampling, pollution, habitat destruction, and introduction of exotic species.

C. Increase pupfish population in Unnamed Springs by 100% through habitat improvement.

D. Increase public awareness, appreciation, and support for pupfish management.

III. Management Methods

A. Livestock Grazing

1. School Spring
A fully protected exclosure was built around the spring during FY 69. An adjacent livestock exclosure was built in FY 70 to prevent livestock trampling at a newly created pond for public viewing.

Water appropriation was made by the State Engineer to Mr. Warren O. Wagner for stock watering and domestic purposes in 1953. Mr. Wagner has made no grazing use of his allotment since 1961. This was verified in a search of old records. Mr. Wagner has never leased lands for grazing which were adjacent to School Spring. School Spring lands are, and have been, included in a grazing lease to another party. During the Spring of 1969 a simple written agreement was consummated with Mr. Wagner. This guaranteeed him access to his waters by provision of a key.

In the event Mr. Wagner sells his water appropriation numerous problems will be encountered. Efforts are being undertaken to obtain the water appropriation. Mr. Wagner was asked by mail to voluntarily abandon his water right. If this fails, measures will be taken to contest his water right in behalf of the Nevada Department of Fish and Game. New legislation recognizes recreation as a beneficial use of water. In personal correspondence with the State Engineer, it was learned that pupfish habitat protection can be deemed recreation, and therefore, beneficial use.

2. Jackrabbit Spring
This spring is included in a Section 15 grazing lease to Spring Meadows Inc., total about 73,000 acres. Spring Meadows Inc. retains water rights for the spring. An agreement must be consummated with this incorporation which will (1) provide them legal access to the proposed fenced area and spring, (2) allow for livestock and irrigation uses of the waters and (3) eliminate pumping from the spring source.

One acre should be fenced around the spring to provide total protection against livestock trampling, exotic introductions, and habitat destruction. Six foot high chain link fencing will be necessary. A second exclosure, about two acres in size, will be constructed as a livestock barrier. This will protect an area where the public may view pupfishes and interpretive facilities. Standard livestock fencing will be adequate.

3. Unnamed Springs
These are included within a small Section 15 lease to Mrs. Norine Scruggs. Proposed ponds will need protection from livestock trampling. About two acres of standard livestock fencing will be adequate. An agreement will have to be consummated with Mrs. Scruggs which will (1) provide for her legal access to the proposed fence area and spring, and (2) allow for livestock and irrigation uses of the waters.

B. Wildlife Use

The Nevada Department of Fish and Game will protect Nevada Pupfishes through enforcement of NRS. 503.58.5, making it illegal to capture, remove, or destroy any species threatened with extinction (includes Cyprinodon nevadensis).

Employees of the Nevada Department of Fish and Game will remove exotic species of fishes from School Spring and Jackrabbit Spring so far as is practical.

C. Habitat Development and/or Improvement

1. School Spring
By FY 70 all necessary improvements will be completed.

Maintenance of spring flow will be the only potential management problem. Consideration will be given to a well as a water source when and if spring flow subsides.

a. A well equipped with electric pump will fill a 10,000 gallon storage tank. Water will be piped to each of the three pools and regulated by float valves. This should be adequate to replace pool storage three to four times for each operation of the pump.

2. Jackrabbit Spring

a. A pumping pit should be excavated 300 feet from the spring, preferably in the ditch leading southward. Pit excavation will be completed by Spring Meadows Inc., and will replace the spring pool as a pumping site.

b. A fully protective exclosure shall be constructed on about 1 acre around the spring source <u>if</u> a pumping pit is employed as a pumping site. Fencing would be six foot high industrial chain link type with a three foot walk-through gate (see appendix).

A second exclosure, of standard barbed wire fence, will provide the public a viewing and interpretive facility.

c. A fish barrier will be constructed in the ditch, slightly within the protected exclosure fence. This will prevent introduced exotic fishes from entering the spring source. The barrier will consist of a flow through, elbow shaped, corrugated metal pipe (see appendix). A vertical drop of only 2-3 feet will impose an adequate barrier. A 24 inch diameter C.M.P. will be adequate. Grooved channel iron will be welded to the inflow to hold adjustable redwood splash boards. The barrier will be mounted in concrete.

d. A second fish barrier will be constructed within the ditch leading to the pumping pit. This will consist of a relatively "pupfish proof" screen. The screen will slide into rubber lined grooves in a small concrete weir. Nevada Department of Fish and Game will provide this.

e. Interpretive facilities will be constructed, similar to those at School Spring. They will include: an interpretive sign, picnic tables and trash cans within the public observation exclosure, and a toilet situated so as not to pollute the spring.

3. Unnamed Springs

a. The springs will be protected by about two acres of standard barbed wire fencing, equipped with walk-through styles.

b. Each water course leading from the spring will be improved for pupfish by hand tool excavation of small (4-6 feet wide) pools.

c. A small interpretive sign will be constructed.

D. Land Acquisition, Classification and Withdrawal.

All necessary classification has been proposed (see intensive inventory and analysis).

During a Death Valley Seminar, Nov. 18-19, 1969, the Nature Conservancy proposed purchase of Big Spring, which is in private ownership. They have asked BLM for possible assistance in this acquisition through an exchange of public lands. Big Spring contains Cyprinodon nevadensis mionectes.

E. Information and Education

1. Continue talks and slide presentations to interested groups.

2. Complete informative brochure for Unnamed and Jackrabbit Springs once full development is completed (see appendix, School Spring brochure).

F. Maintenance of Improvements

Maintenance funds will be programmed by the Bureau as needed. BLM, University of Nevada, Las Vegas and Nevada Department of Fish and Game will complete normal maintenance duties during routine visits to the area. BLM will have primary responsibility for replacement of materials and large maintenance jobs. All three agencies will maintain a close liaison regarding field trips, inspections, and maintenance. Recreation facilities (toilets, tables) should not be provided at Jackrabbit Spring until wildlife funds are adequate for annual routine maintenance (about $500).

IV. Management Evaluation

The University of Nevada, Las Vegas, and the Nevada Department of Fish and Game shall study, and report in writing, annually, the population status of C. n. mionectes in Jackrabbit Spring, and C. n. nectoralis in School and Unnamed Springs. These data shall be used to evaluate success and effectiveness of habitat improvements.

The University of Nevada, Las Vegas, shall encourage responsible students to study habitat requirements of pupfishes. Needed data includes:

(1) role of submergent vegetation as cover, food, etc.

(2) food requirements.

(3) space and water depth preference and requirements.

(4) requirements for dissolved oxygen, temperature, dissolved salts, light intensity, current, and bottom substrate type.

(5) annual fluctuations in population size.

(6) spawning requirements.

V. Implementation Sequence

A. Current Year (FY 70)

1. School Spring livestock exclosure, picnic tables, trash cans, and toilet.

2. School Spring brochure.

B. Budget Year

1. Jackrabbit Spring fencing.

2. Weir, barrier, and fish screen.

3. Jackrabbit Spring interpretive sign.

4. Unnamed Springs fencing.

5. Unnamed Springs ponded habitat.

6. Unnamed Springs interpretive sign.

C. Program Year

1. Brochure for Jackrabbit and Unnamed Springs.

2. Habitat evaluation and maintenance ($\frac{1}{2}$ MM yearly).

D. Program Year +1

1. Annual maintenance.

2. Jackrabbit Spring tables, toilets, trash cans.

VI. Review and Modification

This plan must be considered a flexible one. Rapidly changing field conditions necessitate alterations in plans and methods. A plan can offer only general guidance. BLM, Nevada Department of Fish and Game and the University of Nevada, Las Vegas, shall maintain close liaison. Sudden drops in water table and spring flow may require short notice emergency requests for funding to finance construction of the suggested well and pumping system as an alternative water source. This plan will be reviewed and updated annually.

VII. Maps and Records

Correspondence and other records are maintained in BLM file 6840-13.

VIII APPENDIX

Form 1010-3
(October 1968)

INSTRUCTIONS

Cost columns 4, 7, 10, 13 16, and 19 to be reported in $100's

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

PROGRAM PACKAGE INPUTS SCHEDULE

ACTIVITY CODE	PWE CODE	BUDGET YEAR FY			PROGRAM YEAR FY			PROGRAM YEAR + 1 FY			PROGRAM YEAR + 2 FY			PROGRAM YEAR + 3 FY			PROGRAM YEAR + 4 FY		
		UNITS	COST	MAN-MONTHS	UNITS	COST	MAN-MONTHS	UNITS	COST	MAN-MONTHS	UNITS	COST	MAN-MONTHS	UNITS	COST	MAN-MONTHS	UNITS	COST	MAN-MONTHS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
1280	350		100	1															
1280	410	2	350		1	100													
1280	640	1	100	1															
1280	740					50	1		50	1		50	1		50	1		50	1

GPO 846-955

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Form NSO-6600-1
September 1967
(NF&G-BLM Coop. Form)

District: Las Vegas, Nevada

Prepared by: Lewis H. Myers

Reviewed by: Lewis H. Myers Jr.
BLM District Wildlife Specialist

NF&G District Representative

WILDLIFE HABITAT PROJECT AND/OR HABITAT MANAGEMENT PLAN

Name of Project or Plan Ash Meadows Pupfish Habitat Protection

Location of Project or Plan Jackrabbit Spring and School Spring, Ash Meadows, Nevada

Species Benefited (Cyprinodon nevadensis mionectes)and(C.n. pectoralis)

Description of Job or Project Habitat management plan to determine the needs in protecting the Nevada pupfish from extinction.

Justification and Priority This fish is included in the "Redbook" of rare and endangered species. A great deal of local public interest has been directed towards its protection.

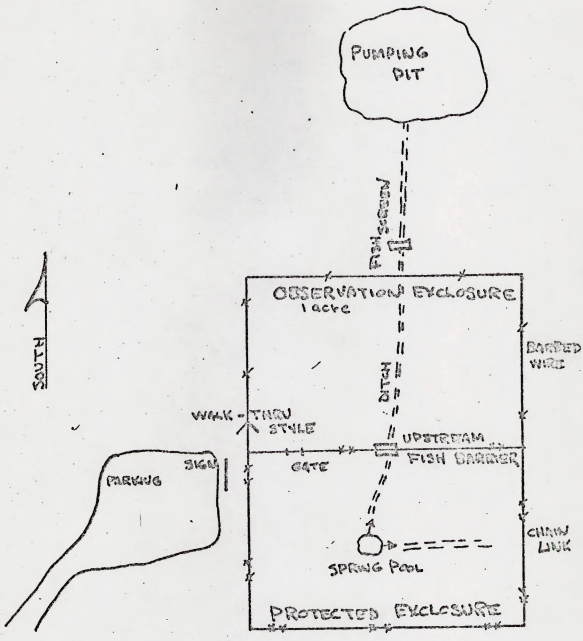
Cost and Manpower Estimates Approximately 1 man-month between both agencies.

Cooperative Funding (if any) Each agency will finance its own operations.

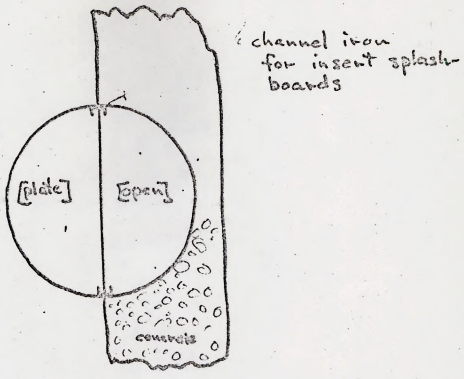
Approved:

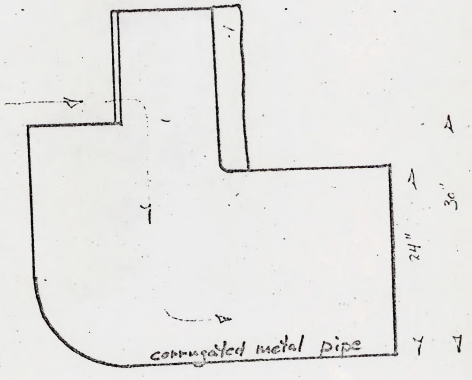
District Manager, BLM

District Supervisor, NF&G

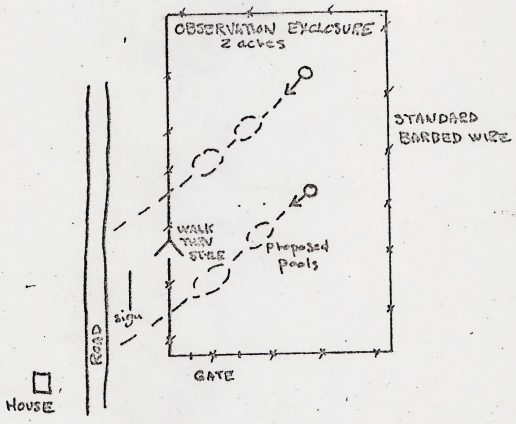


PROPOSED JACKRABBIT SPRING DEVELOPMENT

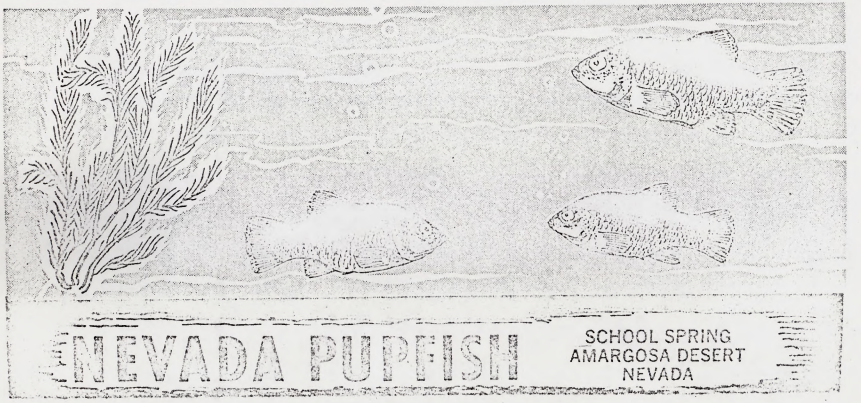




JACKRABBIT SPRING FISH BARRIER



PROPOSED UNNAMED SPRINGS DEVELOPMENT


NEVADA PUPFISH
SCHOOL SPRING
AMARGOSA DESERT
NEVADA

INTENSIVE INVENTORY AND ANALYSIS

ASH MEADOWS PUPFISH HABITAT

N5-WHA-A1

I. Habitat Condition

A. Present Condition

1. Food
   Little is known of food habits of pupfishes (Cyprinodon nevadensis). LaRivers (1962) deduced on herbivorous feeding pattern from the long, twisted intestine. No measure of phytoplankton production has been undertaken. Visual inspection indicates a good production of plankton upon rooted submergents (identify), in School Spring. Jackrabbit Spring food production is probably much less.

2. Cover
   Cover requirements are unknown for pupfishes. It has been observed that pupfishes do well in extremely dense vegetative cover and conversely well in open ditches devoid of cover. Some submergent cover is desirable since male territorial defense is based on visual response to other males.

3. Water

   a. School Spring
      Waters amounting to .002 cfs have been appropriated (13221) to Mr. Warren O. Wagner, 738 E. Walnut St., Pasadena 4, Calif., for stockwatering (40 cattle and 20 hourses) and domestic purposes. Pupfish habitat is limited by water quantity.

   b. Jackrabbit Spring
      Waters amounting to 2.54 cfs have been appropriated (161) to Spring Meadows Inc., Box 240, Vicksburg, Mississippi, for domestic and irrigation (254 acres) purposes.

      The University of Nevada, Las Vegas, measured spring flow during December, 1968. Total spring outflow was .066 cubic meters per second (2.33 cfs).

      Flow was more than adequate for a potential extensive system of ponds.

      On July 25, 1969, a large pump system with 10-inch casing and propane powered motor (about 100 horsepower) was discovered erected on a steel frame directly over the spring. Actual pumping reduces the spring hole to a small pool about one foot deep. It has also been reported by NF&G employees that spring flow is inadequate to maintain a pool and outflow during operation of a new well 1-1/2 miles east.

c. Unnamed Springs (2)
Waters amounting to 1.0 cfs have been appropriated to Mrs. Ruth Simpson and/or Mrs. N. B. Scruggs.

The larger springs of the Ash Meadows originate from the same carbonate-rock system. The bulk of the water originates in the Spring Mountains, east of Ash Meadows, and moves generally westward where it is discharged (Worts, 1963).

These springs have rather common physical and chemical properties, being warm and quite hard ($CaCO_3$). Analysis of Devil's Hole waters showed hardness as $CaCO_3$ of 214 ppm. calcium and sodium were both high at 51 and 66 ppm, respectively. Jackrabbit Spring averages about 82° F yearlong. School and Unnamed Springs are much warmer, averaging 92° F.

Dissolved oxygen concentration is low at these high temperatures. Jackrabbit DO varies diurnally from about 3.8 to 6.0 ppm (Deacon, 1967). DO saturation of 100 percent at 28° C would be only 7.7 ppm. No DO data are available for School and Unnamed Springs.

We would expect that oxygen requirements are quite low for pupfishes, particularly subspecies rectoralis. School Spring is characterized by smaller flow than the others, and by high organic content (dense submergent growth). Thus, nighttime DO is probably extremely low, when organic decomposition continues, photosynthesis (thus O_2 production) ceases, and plant and animal respiration continues.

4. Living Space

Male pupfish adamantly defend an area about one foot in diameter for reproduction purposes. Potential pupfish population is thus a function of available ponded space suitable for reproduction. Vegetative cover may increase the breeding potential of an area. Preferred pupfish habitat is near the surface. There is good evidence that pupfish formerly inhabiting Jackrabbit Spring were "pushed" out of preferred habitats by exotic fishes and forced to live at reduced densities in deeper, more swiftly flowing waters.

A. School Spring
A hole approximately 7 feet in diameter, and 1 foot deep receives flow from the spring. During FY 69 habitat was increased by about four times by excavation of two new ponds. One within the protective exclosure, the other within the public observation exclosure 200 feet below the spring.

b. Jackrabbit Spring
The University of Nevada, Las Vegas, measured available habitat in 1968. Surface area of the pond was 59.5 square meters. Volume of the spring hole was 31.062 cubic meters. Flow was sufficient to replace the entire volume in 7.84 minutes. Two outlet ditches formerly provided additional pupfish habitat with flows 2 to 3 feet wide and about 6 inches deep.

c. Unnamed Springs [2]
At present these two springs consist of rapid outflow (totaling 1.0 cfs) in small ditches about 1 foot wide, flowing several hundred feet on public domain. Ponded space is unavailable.

B. Capability of the Habitat for Improvement

1. School Spring
Maximum use is being made of available water. Excess flow is piped to a small pond (ten feet in diameter) in the observation exclosure.

2. Jackrabbit Spring
This spring is not suitable for pupfish habitat at present. This resulted from installation (by water user) of a large pump directly into the spring. During pumping the spring pool is reduced to a small turbulent pool of rechange. This dries outflowing ditches and most of the spring pool.

3. Unnamed Springs [2]
Potential is good for increase in habitat by excavation of a series of small ponds.

II. Population Condition

A. Present Condition

1. School Spring
Data are unavailable for the fish population. Prior to habitat improvements in FY 69, pupfishes probably totaled less than 200. Populations should increase by at least 200 percent in reaction to increases in habitat space.

2. Deacon and Ivy (unpublished) have done considerable trapping in Jackrabbit and Big Springs in studies of pupfishes. One aspect of their study involved estimates of abundance by the Petersen Index method.

Population estimates of pupfishes in Jackrabbit were made in November, 1965 and April, 1966. The first estimate was 2,025 fish, while the latter gave an estimate of 403 fish. These reflect earlier findings of greater seasonal abundance in fall (November) than in spring (April). Since pupfishes begin breeding in April, we would expect a low in the population at this time.

During April 8-9, 1964, Deacon and Ivy (unpublished) found that Jackrabbit Spring also contained Speckle Dace (Rhinichthys osculus). Ash Meadows Poolfish (Empetrichthys merriami) once occupied Jackrabbit Spring. This species is apparently now extinct throughout Ash Meadows Valley, to which it was formerly restricted.

During July, 1969, Spring Meadows, Inc. (water right holder) commenced pumping directly from the spring source with a large pump. Initial effect was extermination of all fish life within the spring and outflow ditches. It was postulated that during pumping the entire water course was dried except for a small pool, about 1-2 feet deep, consisting of inflow. Presently there is no fish population in Jackrabbit Spring, except Gambusia affinis.

B. Potential Carrying Capacity

1. School Spring
   There is no potential for increased populations beyond that induced by present increases in ponded habitat.

2. Jackrabbit Spring
   Theoretically has potential for restoration of a population near 2,000 pupfish.

3. Unnamed Springs (2)
   Populations could be doubled by provision of new ponded habitat.

Pupfishes apparently spawn from April through July. They are reported to be prolific, laying some 30 eggs (one at a time) during each spawning (Deacon, 1967). Pupfishes have a short life span; possibly less than two years. This implies an inherent susceptibility to catastrophe, where an entire population is represented by only one or a few generations. It is conceivable that adverse conditions during the breeding season (April - July) could endanger the entire population.

Deacon (1967) estimates pupfishes defend an area about one foot in diameter. Spawning usually occurs in this area but a nest is not constructed. This gives some indication of the limited numbers which can reproduce in a given area.

III. Utilization

A. Present

There is no harvest or utilization as such, pupfishes being very small and of no economic importance. These fishes are of considerable interest to researchers. Pupfishes are remnants of an extensive Pleistocene aquatic system, and as such are of great evolutionary significance.

Two papers have been published utilizing information derived from work at Jackrabbit and School Springs. These springs have also been important components of studies currently in progress funded by two National Science Foundation grants totaling $55,000.00 and two National Park Service grants totaling $10,700.00. Dr. James E. Deacon urges that preservation of these areas is extremely important to University of Nevada research programs.

B. Potential

Recreational value can be enhanced considerably through interpretive efforts. Interpretive efforts were completed during FY 69. These included a sign at the site, and a descriptive brochure (appendix). Facilities for recreationists will include; a public viewing exclosure where transplanted pupfishes can be seen in a newly constructed pond, picnic tables, toilets, and garbage cans. Interpretive brochures include a map to the School Spring site. No facilities (or interpretive materials) are available for Jackrabbit or Unnamed Springs.

IV. Limiting Factor Related Problems

A. School Spring

Extent of ponded area is limiting to pupfish production. This in turn is limited by quantity of available water. During FY 69 ponds were excavated to make useable habitat with all available water. Ultimate limiting factor is loss of the spring flow through drop in water table. Water table is expected to drop drastically in the next few years as a result of extensive agricultural development in the valley especially, including numerous new large capacity wells within 1 to 3-1/2 miles.

B. Jackrabbit Spring

La Rivers (1962) noted that the introduction of crawfish (Procambarus clarkii) and bullfrog (Rana catesbeiana) correlated with elimination of the once teeming pupfish population in Fairbanks Spring. He believed these species are both detrimental to pupfishes.

Crawfish and bullfrogs have subsequently become established in all major springs of the Ash Meadows area. Deacon and Ivy (unpublished) have observed crawfish stalking and capturing pupfish in Jackrabbit Spring. These species still persist in Jackrabbit Spring despite periodic drying following pumping.

Exotic fishes formerly inhabited water courses (ditches) connecting with Jackrabbit Spring in great numbers. They included mollies (Poecilia latipinna), and mosquitto fish (Gambusia affinis). A few mosquito fish are still present.

Deacon and Ivy (unpublished) have done some research into the influence of exotic fishes. Trapping results show that population density (pupfish) in Jackrabbit Spring in April, 1964, was more than twice as high as it was in April, 1966, about 16 months after introduction of mollies. Notable also was the finding that population density (pupfish) was greater in Jackrabbit than in Big Spring, where mollies have been established much longer, and that mollies and mosquitto fish have been effective in usurping surface water portions of pupfish habitat. It is believed that mollies were introduced into Jackrabbit Spring in January, 1966.

Despite elimination of all fishes, this spring will be susceptible to re-invasion of exotic fishes via the outflowing ditches when and if spring flow is resumed.

On July 26, 1969 (see memo to files, 6840-M3, dated 7-28-69) it was noted that Spring Meadows Inc. (water user) had constructed a pump system on Jackrabbit Spring. This consisted of a metal framework spanning the spring and a propane powered pump of approximately 100 horsepower. A 10-inch casing is suspended into the spring and extends within about one foot of the spring bottom. Flexible rubber hose, 10 inches in diameter, extends across public domain (SE¼NW¼, Sec. 18, T.18S., R.51E.) in an easterly direction towards public lands recently exchanged. The initial effect of this pumping was nearly complete extermination of fish life within the spring pool and outflowing canals. It was found that operation of the pump reduces the spring pool level to a small (about one foot deep) turbulent pool consisting of spring inflow. This reduction in pool level quickly dries up outflowing ditches where most fish life was formerly found.

The ultimate limiting factor will be a drop in water table as a result of extensive large capacity well pumping in the valley.

Recent field investigation suggests that operation of high capacity wells and pumps within 1-1/2 miles of the spring drastically reduces flow.

C. Unnamed Springs [2]

Limiting factor is ponded habitat or space.

V. Solutions

A. School Spring

Maximum use is being made of all available water with new ponds. No suggestion as to control of water table in Ash Meadows Valley. This subject will be discussed at a seminar in Death Valley, November 18-19, 1969.

B. Jackrabbit Spring

Remove pump from Jackrabbit Spring and provide a pumping pit separate from the spring which would receive its full flow. This would permit spring source and ditches to remain intact and provide fish habit.

No suggestion as to control of water table in Ash Meadows Valley.

C. Unnamed Springs [2]

Construct new ponded habitat.

VI. Management Methods

A. Livestock Grazing

1. School Spring
Included within a section 15 grazing lease to Mrs. Norine Scruggs for about 4,980 acres. The spring has been effectively protected from livestock use by fencing.

2. Jackrabbit Spring
Included within a section 15 grazing lease to Spring Meadows Inc. for about 73,000 acres. The spring should be fenced to prevent livestock trampling and thoughtless introductions of exotic fishes.

3. Unnamed Springs
Included within a section 15 grazing lease to Mrs. Norine Scruggs for about 4,920 acres. Proposed ponds will need protection from lessee's horses. Lessee retains water appropriation for both springs. This will necessitate a special agreement with provision for lessee's stock watering and legal access. A similar agreement was obtained from Mr. Warren O. Wagner for fencing at School Spring.

B. Wildlife Population Use

1. School Spring
The spring has been nearly ridded of exotic fishes (platys). Nevada Department of Fish and Game has cooperated by netting visible exotics. Work will continue until all are removed.

2. Jackrabbit Spring
Provisions should be taken to prevent re-introductions of exotic fishes once the pool is restored.

3. Unnamed Springs
Efforts should be made to clarify taxonomy on these pup-fishes. Are they subspecies pectoralis or mionectes? University of Nevada researchers could help on this.

C. Habitat Development and/or Improvement

1. School Spring
By end of FY 70 all necessary improvements will be completed. Maintenance of spring flow will be the only potential management problem. Consideration may have to be given to a well as a water source when and if spring flow subsides.

2. Jackrabbit Spring
A newly excavated pumping pit would allow the spring pool to be maintained. Needs also include a fully protected exclosure, a fenced livestock exclosure for public use, and a fish barrier in the water course to inhibit movements of exotic fishes.

3. Unnamed Springs (2)
Several new ponds should be constructed along the water course from each spring. These ponds should be protected from livestock trampling by small barbed wire exclosures.

D. Land Acquisition, Classification and Withdrawal

Progress to date follows for each Spring:

1. School Spring
   Small tract application rejected by Nevada State Director, October 21, 1968.

   Small tract application appeal dismissed by Director's Office February 17, 1969. Appeal to Secretary's Office pending.

   Classification and designation proposed May 8, 1969. Described area totaled 60.00 acres.

   Classification will not be finalized until small tract application appeal is denied by Secretary's Office.

   No further acquisition, classification, or withdrawals will be necessary.

2. Jackrabbit Spring
   Notice of proposed classification (Serial No. N-3319) published December 20, 1968. The lands described totaled 56.35 acres.

   Designation (per CFR 1727) proposed May 8, 1969, as "Jackrabbit Spring Pupfish Habitat Area".

3. Unnamed Springs
   On October 31, 1969, a proposal for classification (C&MUA) was submitted to the Stateline Resource Area Manager. It was recommended the following described areas be included in multiple use classification with segregation against applicable land entry and mining laws:

   T.17S., R.50E.,
   Sec. 35, SW¼NE¼, NW¼SE¼.

4. Devil's Hole National Monument
   On October 31, 1969, a proposal for classification (C&MUA) was submitted to the Stateline Resource Area Manager. It was recommended the following described areas be attached to the Nye County Sub-Area by slight adjustment of the boundary and included under classification for multiple use management with segregation against land entry:

   T.17S., R.51E.,
   Sec. 31, NE¼NE¼, W½E½, W½.

T.17S., R.50E.,
Sec. 35, E½NE¼, N½NE¼SE¼.
Sec. 36, W½, NE¼, N½SE¼, SE¼SE¼.

T.18S., R.51E.,
Sec. 6, NW¼, N½SW¼, W½NE¼, SE¼.

T.18S., R.50E.,
Sec. 1, N½;
Sec. 2, NE¼.

This classification will provide a buffer area around the Park Service monument established by Presidential Proclamation in 1952 to protect the Devil's Hole pupfish.

E. Information and Education

An acute need exists for acquainting the public with our rare and endangered fish species. Only in this way can support be obtained for a management program. During FY 70 an interpretive brochure was completed for the School Spring development. The following measures are recommended.

1. Continued talks to interested groups and persons.

2. Completion of a brochure for Unnamed and Jackrabbit Springs once management is implemented.

3. Interpretive signs at Unnamed and Jackrabbit Springs.

VII. Objectives

A. Obtain restoration of Jackrabbit Spring pool and pupfish population by negotiations with Spring Meadows Inc.

B. Increase pupfish population in Unnamed Springs by 100% through habitat improvement.

C. Protect pupfish habitat at Jackrabbit, School and Unnamed Springs.

D. Increase public awareness, knowledge, and support through information and education efforts.

VIII. Public Opinion, Support, and Guidance

This species was included in a publication "Rare and Endangered Fish and Wildlife Species of the United States", compiled by the Committee on Rare and Endangered Wildlife Species, Bureau of Sport Fisheries and Wildlife, U. S. Department of the Interior, July, 1966. Official status is listed as undetermined. Dr. James E. Deacon, University of Nevada, submitted recommendations to the committee for a change of status to "rare". In reality, the species is endangered by virtue of extensive agricultural development by Spring Meadows, Inc.

To date, acknowledgement and support for pupfish management has been received from the following organizations and agencies:

1. Bureau of Sport Fisheries and Wildlife.
2. Dr. Robert R. Miller, American Society of Ichthyologists and Herpetologists, and University of Michigan.
3. Dr. James Deacon, University of Nevada.
4. Dr. Carl Hubbs, University of California, Scripps Inst. of Oceanography.
5. National Park Service.
6. Foresta Institute.
7. Tahoe College.
8. Lahontan Audubon Society.
9. The Nature Conservancy.
10. Nevada Outdoor Recreation Association.
11. Nevada Highway Department.
12. Nevada Department of Fish and Game and Nevada Fish and Game Commission.
13. Sierra Club.
14. Nevada Open Spaces Council.
15. Dr. David W. Greenfield, California State College.
16. Dr. George S. Myers, Stanford University.
17. Endangered Species Committee.

Also, about 25 individuals, in addition to those representing the above agencies, have written letters of support and/or attended meetings relative to the BLM program.

IX. Implementation Sequence

A. Budget Year

1. School Spring livestock exclosure, picnic table, trash cans, and toilet.

2. School Spring brochure.

B. Program Year

1. Jackrabbit Spring fencing.

2. Weir and fish screen.

3. Jackrabbit Spring interpretive sign, tables, trash cans, and toilet.

4. Unnamed Springs fencing.

5. Unnamed Springs ponded habitat.

6. Unnamed Springs interpretive sign.

C. Program Year +1

1. Brochure for Jackrabbit and Unnamed Springs.

2. Habitat evaluation (1/2 MM yearly).

D. Program Year +n

1. Maintenance (amount to be determined).

2. Habitat evaluation (1/2 MM yearly).

X. Management Evaluation

The University of Nevada, Las Vegas, and the Nevada Department of Fish and Game Commission shall study, and report in writing, annually, the population status of *C. n. nionestes* in Jackrabbit Spring, and *C. n. rectoralis* in School and Unnamed Springs. These data shall be used to evaluate success and effectiveness of habitat improvements.

The University of Nevada, Las Vegas, shall encourage responsible students to study habitat requirements of pupfishes. Needed data includes:

(1) role of submergent vegetation, cover, food, etc.

(2) food requirements.

(3) space and water depth preference and requirements.

(4) requirements for dissolved oxygen, temperature, dissolved salts, light intensity, current, and bottom substrate.